Received June 5, 1766.

XXVI. *A Letter to the Preſident of the Royal Society, containing a new Manner of meaſuring the Velocity of Wind, and an Experiment to aſcertain to what Quantity of Water a Fall of Snow is equal.*

Kirknewton, May 13, 1766.

My Lord,

Read June 19, 1766. I Should think myſelf moſt unworthy of the honour which your lordſhip and the Royal Society have done me, if the notice which you was pleaſed to take of my letter upon the late comet, did not make me more careful to obſerve whatever, I thought, might tend to improve the knowledge of nature, which is a capital part of the laudable deſign of the Society.

Your lordſhip knows, that my ſituation expoſes me to every blaſt that blows, and affords a fair opportunity for meaſuring the velocity of the wind (the force of which I am, ſo often, obliged to feel). I have attempted to determine this by letting light downy feathers fly in the wind (the method, I underſtand, uſed by the ingenious Dr. Derham); but cannot ſay, in all the trials I have made (though I have let fifty of theſe feathers fly, one after the other, at a time), that I have ever ſeen above one, or two at moſt, upon which I could have founded a calculation. The velocity of the wind near the earth is very unequal, upon account of the

the frequent interruptions it meets with from hills, trees, and houſes; and even in open plains, the ſurface of the earth, though much ſmoother than it commonly is, muſt reflect, and interrupt ſuch a fluid as the air, and occaſion great irregularity in the velocity of its current: this is the reaſon, when a feather is let fly with the wind, why it ſeldom, if ever, deſcribes a ſtrait line, but moves ſometimes in a kind of ſpiral, now high, and then low, ſometimes to the right, and then again to the left; and why two feathers let fly at once, ſeldom, if ever, keep together, or deſcribe ſimilar lines.

But, at ſome conſiderable diſtance from the earth, the velocity of the wind ſeems to be regular and ſteady: nothing can be more uniform, than the velocity of a cloud in the ſky appears to be, even in the greateſt ſtorm: it is like a ſhip carried away inſenſibly by a ſmooth and gentle current, paſſing over equal ſpaces in equal times. This ſuggeſted the thought, that the motion of a cloud, or its ſhadow, over the ſurface of the earth, would be a much more proper meaſure of the velocity of the wind.

In the end of March 1763, I had as favourable an opportunity of putting this method into practice, as I could have wiſhed for; the ſtorm was exceeding high, and moved with vaſt velocity; the ſun was bright, the ſky clear, except where it was ſpotted with light floating clouds; I took my ſtation in the north window of my dining room, near the clock, from which I had a free proſpect of the fields; the ſun was in the meridian, the wind due weſt interſecting his rays at right angles; I waited until the fore-part of the ſhadow of a cloud, that was diſtinct, and well

defined, juſt touched a ſouth and north line, which I had marked upon the ground; at that inſtant I began my reckoning, and followed the ſhadow with my eye in its progreſs, counting ſeconds all the while by the clock, until I had reckoned up 15 ſeconds; then I obſerved exactly where the foreſaid edge of the ſhadow was. This experiment I repeated ten times in half an hour, and ſeldom found the difference of a ſecond, in the time which different clouds took to move over the ſame ſpace. On the 5th of May current, I repeated the trial four different times, the ſun being alſo near the meridian, the wind in the weſt, with light clouds floating in a clear ſky as formerly; and found that the ſhadows of different clouds took ſome of them 44, and others 45 ſeconds, to paſs over the ſame ſpace which they had moved over in 15 ſeconds, in the former trials.

Feet.

This ſpace meaſures exactly 1384 = ſpace paſſed over in 15 ſeconds,
which multiplied by 4
gives 5536 = ſpace paſſed over in one minute,
which multiplied by 60
gives 332,160 = ſpace paſſed over in one hour.

Which ſpace is = 62.9 Engliſh miles per hour, the velocity of the wind in March 1763.

One third of this (or 21 miles nearly) ſhews the velocity of the wind on May the 6th, when it blew a freſh gale.

This day, May 12, there was a ſmall weſterly breeze, the velocity of which I meaſured upon the ſame line, the ſun being 10 minutes paſt the meridian, and found that the ſhadow took 95 ſeconds to paſs over the above

above ſpace, which gives the velocity of the wind at the rate of 9.9 Engliſh miles per hour.

Thus, by having ſeveral lines in different directions of a known length marked upon the ground, one may eaſily (and with great accuracy, I imagine), meaſure the velocity of the wind. If a perſon was provided with an inſtrument for meaſuring the force of the wind, it would perhaps be worth while to obſerve, whether, when the velocities of different winds were the ſame, (or nearly ſo) the forces of theſe winds did not vary with the ſeaſons of the year, the points of the compaſs from which the wind blows, and alſo with the different ſtate of the barometer and thermometer, ſince the momentum of the wind depends not only upon its velocity, but alſo upon its denſity.

From the end of March 1765, to the end of March laſt, we, in this part of Scotland, had very little rain, and leſs ſnow in proportion; our rivers were as low, through the winter, as they uſe to be in the middle of ſummer; ſprings failed in moſt places, and brewers and maltſters were obliged, even in winter, to carry their water at a conſiderable diſtance; I was much afraid there would not be moiſture enough in the earth for the purpoſes of vegetation, if this ſeaſon ſhould ſet in as dry as the former, before we got a new ſupply of rain. In the end of March laſt, we had a fall of ſnow; and, as I did not remember to have ever read an account of ſuch an experiment, I wiſhed to be able to determine, to what quantity of rain this fall of ſnow was equal.

The ſnow had been falling from five o'clock the former evening, till ten o'clock next day; about eleven o'clock I meaſured the depth of the ſnow, and found

it to be 6.2 inches; then I took a ſtone jug, holding about three Engliſh pints, and turned the mouth of it downwards upon the ſnow meaſured, and where the ground below was ſmooth, and hard; and by this means I took up all the ſnow from top to bottom in the jug; this ſnow I melted by the ſide of a fire, and the 6.2 inches of ſnow yielded ſix tenths of an inch deep of water in the ſame jug. After emptying the jug, I dried, and weighed it in a balance, and took up the ſame quantity of ſnow in it as before, weighed it again, and found the weight of the ſnow taken up, and from this weight computed what quantity of water it ſhould have produced, and found that it ought to have produced ſix tenths of an inch and $\frac{1}{20}$ of an inch more: then I diſſolved the ſnow, and found that it yielded a quantity of water in the bottom of the jug, ſix tenths of an inch deep as in the former experiment. The difference of $\frac{1}{20}$ of an inch in the depth of the water, betwixt the weight and the melting of the ſnow, was probably owing to an exhalation from the jug, while the ſnow was melting by the fire, for I obſerved a ſteam ſometimes riſing from it. A greater or leſſer degree of cold, or of wind, while the ſnow falls, and its lying a longer or ſhorter while upon the ground, will occaſion a difference in the weight and in the quantity of water produced from a certain number of cubic feet, or inches, of ſnow; but, if I may truſt to the above trials, (which I endeavoured to perform with care) ſnow, newly fallen, with a moderate gale of wind, freezing cold, which was the caſe of the ſnow I made the trials upon, the 27th of March laſt, will produce a quantity of water equal to $\frac{1}{10}$ part of its bulk; or the earth, when covered with ſnow,

ten

ten inches deep, will be moiſtned by it when melted; rivers, and ſprings recruited, as much as if a quantity of rain had fallen that covered the ſurface of the earth to the depth of one inch.

I am, my Lord,

with the greateſt reſpect,

your Lordſhip's moſt obedient

and moſt devoted humble ſervant,

Alex. Brice.

Received June 5, 1766.

XXVII. *Some Obſervations on the Country and Mines of* Spain *and* Germany, *with an Account of the Formation of the Emery Stone*; *from* William Bowles, *Eſq*; *Director General of the Mines of* Spain; *communicated by* P. Collinſon, *F. R. S.*

Read June 19, 1766.

AT the extremity of Old Caſtile, in Spain, is ſituated a territory called Montana, which is divided into two parts; the Low Montana is that chain of mountains, which bounds the